IN THE CLAIMS

Please cancel claims 1-83 from the parent spec and renumber the below listed claims as marked (formerly misnumbered as claims 1-13:

~~1.~~ 84. [currently amended] A ranging process carried out to achieve frame synchronization in any digital data communication system having a plurality of physically distributed remote transceivers transmitting frames of the same size on the same frequency on a shared medium to a headend transceiver, comprising the steps:

(a) iteratively transmitting a ranging signal that has correlation properties such that it can be found in the presence of noise, and conducting a trial and error adjustment of a transmit frame timing delay value prior to each transmission of said ranging signal until receiving a message from said headend transceiver that a ranging signal has been found in a gap surrounding a reference time in an upstream payload data channel, said gap being an interval during upstream transmissions on said upstream payload data channel from said plurality of distributed remote transceivers to said headend transceiver when transmissions of anything other than ranging signals by said remote transceivers is not permitted;

(b) when said message is received by the remote transceiver that transmitted said ranging signal, holding said transmit frame timing delay at the same value it had just before receiving said message, and transmitting identifying information to said headend transceiver to identify said remote transceiver; and

(c) receiving a message from said headend transceiver transmitted on a downstream payload data channel and directed to said remote transceiver which transmitted said identifying information indicating by how much to adjust said

transmit frame timing delay such that frames transmitted from said remote transceiver will have their frame boundaries exactly or almost exactly aligned in time at the location of said headend transceiver with the frame boundaries of frames transmitted from other said remote transceivers.

~~2.~~ 85. [currently amended] The process of claim 84 ~~1~~ wherein one of said gaps is between every upstream frame, and wherein said step of transmitting identifying information comprises the steps of sending a unique sequence of transmissions over an authentication interval comprised of an even number of said gaps, said unique sequence of transmissions comprised of transmissions of said ranging signal and silent intervals when no ranging signal is transmitted during said authentication interval, the exact sequence of ranging signals and silent intervals being unique to said remote transceiver and having ranging signals sent during exactly 50% of said gaps of said authentication interval.

~~3.~~ 86. [currently amended] The process of claim ~~2~~ 85 further comprising the steps performed after step (b) and before step (c) of receiving a message from said headend transceiver indicating whether a ranging signal was received in more than 50% of said gaps of said authentication interval, and, if so, performing a contention resolution algorithm comprised of a random decision to stop said ~~the~~ ranging process or continue with it, with the probability of either outcome being 50%, and if the decision not to continue said ranging process is made, stopping said ~~the~~ ranging process for an interval and not performing step (c), and then commencing said ranging process again with step (a) but starting with the transmit frame timing delay which existed at the time the decision to stop said ranging process was made.

~~4.~~ 87. [currently amended] A ranging process for use in a distributed system comprising a central transceiver coupled by a shared transmission media to a plurality of remote transceiver at physically disparate locations at least two of which send frames of digital data of the same size on the same frequency to said central transceiver, comprising the steps of:

adjusting a transmit frame timing delay value in each remote transceiver so as to achieve frame synchronization such that frames transmitted by each remote transceiver arrive with their frame boundaries aligned in time with the frame boundaries of frames transmitted by others of said remote transceivers which have achieved frame synchronization by performing the following steps in each remote transceiver:

determining the propagation time in said remote transceiver from said remote transceiver to said central transceiver via said shared transmission media by iteratively transmitting a ranging signal which can be detected by said central transceiver in the presence of noise and which is transmitted by said remote transceiver in response to receipt of an invitation signal transmitted by said central transceiver, and adjusting a transmit frame timing delay value for said remote transceiver prior to each transmission of said ranging signal until a transmit frame timing delay value is reached which causes said remote transceiver to receive one or more messages from said central transceiver transmitted on a downstream payload channel and indicating that a ranging signal has been found, and using said messages to determine when a transmit frame timing delay value has been reached that causes said ranging signal to arrive at said

central transceiver during an interval that encompasses a time of arrival at said central transceiver which would cause frame synchronization to exist for said remote transceiver, said interval being referred to hereafter as a gap and said one or more messages indicating a ranging signal has been found in said gap, and then transmitting signals that identify said remote transceiver to said central transceiver, and using information in said one or more messages to make proper additional adjustments to said transmit frame timing delay value so as to achieve frame synchronization with frames transmitted from all other remote transceivers which have previously successfully achieved frame synchronization;

after frame synchronization has been achieved, thereafter using the value so fixed for said transmit frame timing delay for every transmission by said remote transceiver to said central transceiver.

~~5.~~ 88. [currently amended] The process of claim 87 ~~4~~ further comprising the steps of, from time to time after frame synchronization has been achieved, performing the following training process to verify that frame synchronization still exists and make adjustments if it does not still exist, said training process comprising:

sending training data from said remote transceiver to said central transceiver, said training data having its spectrum spread by a predetermined spreading code which is one of the middle codes in a group of contiguous, orthogonal, cyclic spreading codes and is known to said central transceiver;

determining in said central transceiver if said training data was received solely on said predetermined spreading code or if some of the energy of said training data was received on any of said contiguous, orthogonal cyclic codes;

if said training data was received only on said predetermined spreading code, doing nothing;

if some or all of the energy of said training data was received on any of said contiguous, orthogonal, cyclic spreading codes, performing a fine tuning process to calculate the time offset between the actual time of arrival at said central transceiver of a transmission from said remote transceiver and the desired time of arrival which would cause frame synchronization to exist, and sending a message to said remote transceiver telling it by how much to adjust its transmit frame timing delay to achieve frame synchronization.

~~6.~~ 89. [currently amended] The process of claim 87 ~~4~~ wherein said remote transceivers transmit data to said central transceiver in frames each of which includes a guardband during which no data is sent, and wherein said central transceiver sends a message to said remote transcevier when said ranging signal is received at said central transceiver during said guardband, and wherein said step of using said one or more messages to make proper additional adjustments to said transmit frame timing delay value so as to achieve frame synchronization comprises receiving a message that includes fine tuning adjustment data that indicates the distance and direction in time of the actual arrival time of said ranging signal from a predetermined desired location in said guardband which would cause frame synchronization to exist and using said fine tuning adjustment data to adjust said transmit frame timing delay to achieve precise frame synchronization.

~~7.~~ 90. [currently amended] The process of claim 88 ~~5~~ wherein said remote transceivers transmit data to said central transceiver in frames each of which includes a

guardband during which no data is sent, and wherein said central transceiver sends a message to said remote transceiver when said ranging signal is received at said central transceiver during said guardband, and wherein said step of using said one or more messages to make proper additional adjustments to said transmit frame timing delay value so as to achieve frame synchronization comprises receiving a message that includes fine tuning adjustment data that indicates the distance and direction in time of the actual arrival time of said ranging signal from a predetermined desired location in said guardband which would cause frame synchronization to exist and using said fine tuning adjustment data to adjust said transmit frame timing delay to achieve precise frame synchronization.

~~8.~~ 91. [currently amended] The process of claim 87 ~~4~~ further comprising a power alignment process carried out in a remote transceiver comprising the steps:

setting the gain of a scaling amplifier in said remote transceiver to a predetermined initial level;

iteratively transmitting training data having its spectrum spread by a predetermined code in a group of orthogonal, cyclic spreading codes and modulated using BPSK modulation on an upstream radio frequency carrier; and

receiving a final gain correction factor from said central transceiver after said central transceiver has received said iterative transmissions of training data and an adaptive gain control circuit therein has converged on a final gain control factor that minimizes reception errors of said training data; and setting the gain of said scaling amplifier in said remote transceiver to the value of said final gain correction factor.

~~9.~~ 92. The process of claim 87 ~~4~~ wherein each said remote transceiver transmits training data during a training interval, said training data having its spectrum spread with a predetermined one of a plurality of orthogonal, cyclic spreading codes, and further comprising a power alignment process carried out in said central transceiver comprising the steps:

setting the gain of an amplfier in an adaptive gain control circuit in said central transceiver to an initial gain level for a ~~said~~ predetermined one of said plurality of orthogonal, cyclic spreading codes (hereafer said predetermined spreading code) to minimize reception errors of data spread by said predetermined spreading ~~that~~ code;

receiving iterative transmissions of ~~BPSK modulated~~ training data having its spectrum spread by said predetermined spreading code and transmitted by a remote transceiver whose transmission gain level is to be aligned, and making an adjustment to a gain correction factor to reduce slicer error in receiving said training data in said central transceiver after each iteration until convergence on a final gain correction factor is achieved; and

sending the final gain correction factor downstream to said remote transceiver which transmitted said training data, and setting the gain of said amplifier in the adaptive gain control circuit in said central transceiver to one.

~~10~~. 93. [currently amended] The process of claim 87 ~~4~~ further comprising an upstream equalization process carried out in said central transceiver for each remote transceiver comprising the steps:

sending a message to said remote transceiver requesting it to iteratively transmit training data to said central transceiver, said training data having its

spectrum spread by one or more of a plurality of adjacent, orthogonal, cyclic spreading codes;

iteratively adapting the tap weight coefficients of feed forward (FFE) ~~FFE~~ and decision feedback (DFE) ~~DFE~~ equalizers until final tap weight coefficients are derived which minimize reception errors of said training data; and

sending the final tap weight coefficients to said remote transceiver and setting the tap weight coefficients of said FFE and DFE equalizers in said central transceiver to values which render said FFE and DFE equalizers transparent.

~~11.~~ 94. The process of claim 87 ~~4~~ further comprising an upstream equalization process carried out in each remote transceiver comprising the steps:

(a) receiving a message from said central transceiver requesting the transmission of training data;

(b) iteratively transmitting training data having its spectrum spread with ~~one or more of~~ a plurality of sequential orthogonal, cyclic spreading codes;

(c) receiving final tap weight coefficients from said central transceiver after convergence by equalization circuitry in said central transceiver on the final tap weight coefficients that minimize reception errors of said training data;

(d) convolving said final tap weight coefficients received from said central transceiver with existing equalization filter coefficients in said remote transceiver used to send said training data, and setting ~~said~~ equalization filter coefficients of an upstream equalization filter in said remote transceiver to ~~the~~ new tap weight coefficients resulting from said convolving process; and

(e) using said ~~the~~ new equalization filter coefficients derived in step (d) to establish equalization filter characteristics for said upstream equalizastion filter in

said remote transceiver used to filter ~~for~~ subsequent upstream transmissions of payload data from said remote transceiver to said central transceiver.

~~12.~~ 95. [currently amended] The process of claim 87 ~~4~~ further comprising a downstream equalization process carried out in said remote transceiver, comprising the steps:

receiving iteratively transmitting training data on ~~at least one of~~ a plurality of adjacent, orthogonal, cyclic spreading codes transmitted by said central transceiver;

adjusting the tap weight coefficients of a first adaptive equalization circuit including a slicer after receiving each iteration of training data until convergence on final tap weight coefficients is achieved that minimizes reception errors of said training data; and

transferring said final tap weight coefficients to a second equalization circuit in said remote transceiver.

~~13.~~ 96. [currently amended] A ranging process to achieve frame synchronization in each of a plurality of physically distributed remote units that transmit upstream frames of data on the same medium and the same frequency to a central unit comprising the steps:

(a) broadcasting from said central unit a barker code during every frame;

(b) in each remote unit that is attempting to achieve frame synchronization, receiving said barker code broadcast by said central unit, and listening on a control channel until a status signal "empty" is transmitted by said central unit, and responding in said remote unit by ~~iteratively~~ transmitting a ranging pulse ~~the same barker code~~ back

toward said central unit ~~during each upstream frame~~ after setting a trial and error value for a transmit timing delay ~~before each transmission of said barker code~~;

(c) monitoring a ranging interval gap hereafter referred to as said gap using a receiver in said central unit for receipt of said ranging pulse ~~barker code by performing a correlation calculation~~;

(c1) if no ranging pulse is detected in said gap, transmitting an "empty" status signal on said control channel to all remote units;

(c2) in each said remote unit which is sending ranging pulses, listening on said control channel, and when said "empty" status signal is received after transmitting a ranging pulse, adjusting said transmit timing delay value by a predetermined amount and transmitting another ranging pulse and repeating step c2;

(d) when said central unit detects a single ranging pulse ~~barker code~~ in said gap, broadcasting a "status equals single" message to all remote units on a control channel indicating a single ranging pulse ~~barker code~~ has been found in said gap and asking each remote unit that is performing said ranging process to send an authentication ~~a signature~~ sequence to identify itself where said authentication ~~signature~~ sequence comprises sending ranging pulses ~~said barker code~~ during a predetermined number which is less than all of the frames of a multiple frame authentication interval using the same transmit timing delay used in the last transmission of a ranging pulse ~~barker code~~ before receiving the message from said central unit that a single ranging pulse ~~barker code~~ had been detected in said gap ~~the guardband~~, said transmissions of said ranging pulse ~~barker code~~ and silences during said authentication interval defining an authentication ~~a signature~~ sequence which is unique to said remote unit;

(e) performing a determination ~~correlation~~ in said central unit to determine during which gaps of the gaps in said authentication interval said ranging pulses ~~barker codes~~

were received, and if more than ~~said~~ a predetermined correct number of ranging pulses ~~barker codes~~ were received during said gaps of said authentication interval;

(f) if ranging pulses ~~barker codes~~ are found in ~~the~~ said ~~correct~~ predetermined correct number of gaps of said authentication interval, determining the sequence of gaps in which ranging pulses ~~barker codes~~ were found and identifying the remote unit which transmitted ~~the signature~~ said authentication sequence by the sequence of gaps in which ~~barker codes~~ ranging pulses were found ~~and~~ as compared to gaps in which no ranging pulses were found, ~~silences in said authentication interval~~ and broadcasting said identity so found from said central unit;

(g) receiving said identity broadcast in the remote units which are performing said ranging process and, in each remote unit, comparing the identity broadcast to the remote unit's identity, and, if a match is found, performing a fine tuning process to exactly center a ranging pulse ~~barker code~~ transmission in a gap using one or more messages received from said central unit ~~transceiver~~ containing adjustment data so as to achieve precise frame synchronization.

Please add the following new claims:

97. [new] The process of claim 96 further comprising the steps:

(97a) in each of said remote units which are transmitting ranging pulses, if said remote unit hears a "collision" status signal on said control channel after transmitting a ranging pulse, each said remote unit starts a contention resolution process wherein a random decision as to whether to continue sending ranging pulses is made;

(97b) in each of said remote units which decided to continue sending ranging pulses, sending another ranging pulse and listening on said control

channel;

(97c) if another "empty" status signal is heard on said control channel, returning to step c2 and continuing said ranging process from that point by adjusting said transmit timing delay, but if another "collision" status signal is heard on said control channel, returning to step 97a and continuing said ranging process from that point.

98. [new] A ranging process to achieve frame synchronization in each of a plurality of physically distributed remote units that transmit upstream frames of data on the same medium and the same frequency to a central unit comprising the steps:

(a) in each remote unit that is attempting to achieve frame synchronization, receiving a barker code broadcast by said central unit, and listening on a control channel until a status signal "empty" is transmitted by said central unit, and responding in said remote unit by transmitting a ranging pulse back toward said central unit after setting a trial and error value for a transmit timing delay;

(b) in each said remote unit which is sending ranging pulses, listening on said control channel, and when said "empty" status signal is received after transmitting a ranging pulse, adjusting said transmit timing delay value by a predetermined amount and transmitting another ranging pulse and repeating step b until either a "collision" status or a "single" status signal is heard on said control channel;

(c) when a "single" status message is heard on said control channel which is a status signal which is a request from a central unit for each remote unit that is performing said ranging process to send an authentication sequence to identify itself, sending an authentication sequence from each said remote unit which is performing said ranging process, where said authentication sequence comprises sending ranging pulses during

a predetermined number of gaps between upstream frames, said predetermined number being less than all of the gaps between frames of a multiple upstream frame authentication interval, said authentication sequence of ranging pulses being transmitted using the same transmit timing delay used in the last transmission of a ranging pulse before receiving said "single" status message from said central unit, said transmissions of said ranging pulse and silences during said authentication interval defining an authentication sequence which is unique to said remote unit;

(d) receiving an identity broadcast in the remote units which are performing said ranging process and, in each remote unit, comparing the identity broadcast to the remote unit's identity, and, if a match is found, performing a fine tuning process to exactly center a ranging pulse transmission in a gap using one or more messages received from said central unit containing adjustment data so as to achieve precise frame synchronization;

(e) in each of said remote units which are transmitting ranging pulses, if said remote unit hears a "collision" status signal on said control channel after transmitting a ranging pulse, each said remote unit starts a contention resolution process wherein a random decision as to whether to continue sending ranging pulses is made;

(f) in each of said remote units which decided to continue sending ranging pulses, sending another ranging pulse and listening on said control channel;

(g) if another "empty" status signal is heard on said control channel, returning to step (b) and continuing said ranging process from that point by adjusting said transmit timing delay, but if another "collision" status signal is heard on said control channel, returning to step (e) and continuing said ranging process from that point.

99. [new] A ranging process to achieve frame synchronization in each of a plurality of physically distributed remote units that transmit upstream frames of data on

the same medium and the same frequency to a central unit comprising the steps:

(a) broadcasting from said central unit a barker code during every frame;

(b) monitoring a ranging interval gap hereafter referred to as said gap using a receiver in said central unit for receipt of ranging pulses transmitted by said remote units;

(c) if no ranging pulse is detected in said gap, transmitting an "empty" status signal on a control channel to all remote units and listening during said gaps between upstream frames for ranging pulses transmitted by said remote units;

(d) when said central unit detects a single ranging pulse in a gap, broadcasting a "status equals single" message to all remote units on said control channel indicating a single ranging pulse has been found in said gap and asking each remote unit that is performing said ranging process to send an authentication sequence of ranging pulses during a predetermined number of selected gaps between frames of an authentication interval and silence during other said gaps so as to identify itself, said predetermined number of ranging pulses being less than all of the gaps between upstream frames of said authentication interval, said transmissions of said ranging pulse and silences during said said authentication interval defining an authentication sequence which is unique to said remote unit;

(e) performing a determination in said central unit to determine during which gaps of said gaps in said authentication interval in which said ranging pulses were received, and whether more than a predetermined number of ranging pulses were received during said gaps of said authentication interval;

(f) if ranging pulses are found in said predetermined correct number of gaps of said authentication interval, determining the sequence of gaps in which ranging pulses were found and identifying the remote unit which transmitted said authentication sequence by the sequence of gaps in which ranging pulses were found as compared to